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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 11/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/030,993	MIZUNO, TAKESHI	
	Examiner	**Art Unit**	
	Phillip A Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 April 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

Detailed Action

Claims Rejection – 35 U.S.C. 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-35,40-44, and 52-62, are rejected under 35 U.S.C. 102(b) as being clearly anticipated by U.S. Patent No. 5,850,375, to Wilde et al.

Wilde (375) clearly discloses an optical disc drive and pickup that includes a laser-optics assembly 101, an optical switch 104, and a set of single-mode PM optical fibers 102. In the preferred embodiment, each of the set of single-mode PM optical fibers 102 are respectively coupled through a respective one of the set of actuator arms 105 and set of suspensions 130 to a respective one of the set of MO heads 106. As will be discussed shortly, the single-mode PM optical fibers 102 are used in a configuration that, as compared to the prior art, provides: a set of low-noise, low-profile, and low-mass optical paths; increases the data storage capacity per unit volume of system 100; and improves seek and data transfer rates.

FIG. 2 is a diagram showing the laser-optics assembly of the magneto-optical data storage and retrieval system of FIG. 1. In FIG. 2, the laser-optics assembly 101 is shown to include a linearly polarized RF modulated laser source 231 operating in a visible or near ultraviolet frequency region and emitting an optical power in the range from 30 to 50 mw. Laser-optics assembly 101 further includes: a collimating optics 234, a low wavelength dispersion leaky beam splitter 232, and a coupling lens 233. In the preferred embodiment, laser-optics assembly 101 directs (from the linearly polarized laser source 231) a linearly polarized outgoing laser beam 191 (shown in FIG. 1) towards the optical switch 104. Laser-optics assembly 101 further includes: a 1/4 wave plate 238, a mirror 235, and a polarizing beam splitter 232. In the preferred embodiment, a linearly polarized reflected laser beam 192 (shown in FIG. 1) is directed by the optical switch 104 to the coupling lens 233, and is routed by the leaky beam splitter 232 to a differential detector comprising: the 1/4 wave plate 238, the mirror 235, and the polarizing beam splitter 239.

As is well established in the art, this type of differential detection scheme measures the optical power in two orthogonal polarization components of the reflected laser beam 192, with a differential signal being a sensitive measure of polarization rotation induced by the Kerr effect at the surface of one of the set of spinning MO disks 107. In the preferred embodiment, after conversion by a set of photodiodes 236, the differential signal is processed by the differential amplifier 237 and is output as signal 294.

FIG. 3 is a diagram showing an optical path that includes one of the optical fibers and the optical switch of the magneto-optical data storage and retrieval system of FIG. 1. Those skilled in the art will recognize that the set of optical paths of the present invention may be described with reference to a single optical path, shown in FIG. 3 to include: the optical switch 104, one of the set of single-mode PM optical fibers 102, and one of the set of MO heads 106. In the preferred embodiment, optical switch 104 provides sufficient degrees of selectivity for directing the outgoing laser beam 191 towards a respective proximal end of a respective single-mode PM optical fiber 102. The outgoing laser beam 191 is further directed by the single-mode PM optical fiber 102 to exit a respective distal end so as to pass through the MO head 106 onto a surface recording layer 349 of a respective spinning MO disk 107.

During readout of information, the outgoing laser beam 191 (at a lower intensity compared to writing) is selectively routed to the spinning MO disk 107 such that at any given spot of interest 340, the Kerr effect causes (upon reflection from the surface layer 349) the outgoing laser beam 191 to have a rotated linear polarization of either clockwise or counter clockwise sense (shown as 363) that depends on the magnetic domain polarity at the spot of interest 340.

The aforementioned optical path is bi-directional in nature. Accordingly, the outgoing laser beam 191 is reflected and is received through the MO head 106 as the reflected laser beam 192. In the preferred embodiment, the reflected laser beam 192 enters the distal end of the single-mode PM optical fiber 102, propagates along the single-mode PM optical fiber 102 to exit at its proximal end, and is selectively routed

by the optical switch 104 towards the laser-optics assembly 101 for subsequent conversion as signal 294. See Column 3, line 52-67; and Column 4, line 1-67; as well as Column 5, line 1-15.

Wilde (375) also discloses the single-mode PM optical fiber 102 comprises a first segment 598 coupled to a second segment 599, each segment comprising a fast axis (Px) and slow axis (Py). The fast axis of the first segment 598 is preferably aligned with the slow axis of the second segment 599. In the preferred embodiment, the outgoing laser beam 191 has an Ox component and an Oy component and is preferably linearly polarized at an angle of approximately 45 degrees relative to the Px and Py axes of the first segment 598, and the quarter-wave plate 493 comprises a fast axis 489 which is preferably aligned in the optical path at an angle of 45 degrees relative to the Px and Py axes of the second segment 599. In an exemplary embodiment, the quarter-wave plate 493 comprises a square dimension of about 250 um, a thickness of about 89 um, and a phase retardation of about 90 degrees (+/-3 degrees) at a wavelength of interest.

Those skilled in the art will recognize that the first and second segments 598 and 599 may typically be subject to external and/or internal stresses resulting from: mechanical motion, temperature, and pressure; and that, these stresses may affect optical properties of the first and second segments 598 and 599, for example, their birefringent properties. Accordingly, as the Ox and Oy polarization components propagate through the first and second segments 598 and 599, the Oy component acquires a shift in phase of Φ relative to the Ox component. In the preferred

embodiment, the polarization components Ox and Oy exit the distal end of the second segment 599 and are reflected by the reflective substrate 445 so as to be incident with the surface of the quarter-wave plate 493. The Ox and Oy components are preferably reflected equally (within 3% of each other) from a gold surface of the reflective substrate 445. As the Ox and Oy components pass through the quarter-wave plate 493, the Ox component is converted to a left-hand circular polarization, and the Oy component is converted to a right-hand circular polarization, and the two circular polarizations sum to preferably be an outgoing linear polarization having a polarization angle that depends on the phase shift Φ. The outgoing linear polarization is reflected from the MO disk 107 and is rotated by the Kerr effect so as to return with a net phase shift between the circular polarization components equal to $\Phi + \Delta$ where Δ is a phase shift introduced by the Kerr effect. The reflection from the MO disk 107 reverses the sense of each circular polarization (i.e., left-hand becomes right-hand and vice-versa), such that, upon a second pass through the quarter-wave plate 493, the right-hand component is converted to a linear polarization component Tx, and the left-hand component is converted to a linear polarization component Ty. The Tx and Ty polarization components of the reflected laser beam 192 are preferably rotated 90 degrees with respect to the Ox and Oy polarization components of the outgoing laser beam 191, and the Tx component exhibits a phase shift of $\Phi + \Delta$ relative to the Ty component. Those skilled in the art will recognize that in an exemplary embodiment, in which the optical transit time through the PM optical fiber is less than 5 ns, the birefringence of the PM optical fiber will not change appreciably; thus, as the Tx

polarization component of the reflected laser beam 192 propagates back through the second and first segments 599 and 598, the Ty component acquires an additional phase shift of Φ with respect to the Tx component. In this manner, after exiting the proximal end of the first segment 598, the Ty polarization component of the reflected laser beam 192 is phase shifted relative to the Tx polarization component, preferably by only the Kerr phase Δ. The polarization state that emerges from the fiber is elliptical and is converted by the quarter-wave plate 238 of laser-optics assembly 101 to preferably have a linear polarization with a polarization angle proportional to Δ. Subsequently, the linear polarization is detected and converted so as to represent the information stored at the spot of interest 340 as the output signal 294. While the present invention minimizes the effects of birefringence introduced by the first and second segments 598 and 599, those skilled in the art will recognize that the quarter-wave plate 493 also minimizes phase shifts introduced by the optical properties of the reflective surface of the reflective substrate 445. Additionally, while the quarter-wave plate 493 is disclosed to be positioned in the optical path after the reflective substrate 445, those skilled in the art will recognize that in an alternative embodiment, the quarter-wave plate 493 may be positioned between the objective optics 446 and the MO disk 107. See Column 7, line 3-67; and Column 8, line 1-17.

Wilde (375) further discloses an optical disc drive and pickup that includes one or more optical paths for propagation of light between a source of light and a storage location. Each of the optical paths may include one or more optical fibers comprising a first segment and a second segment. The first and second segments

may be coupled together so that an optical orientation axis of the first segment is aligned orthogonally to an optical orientation of the second segment. The first and second segments may be single-mode polarization maintaining optical fibers and their optical orientation axes may be a fast axis. The source of light may be a RF modulated laser source and the storage location may be a magneto-optical storage location. In the present invention an optical fiber may be coupled to a rotary actuator arm, and the rotary actuator arm may include a magneto-optical head. The optical fiber may be coupled to the magneto-optical head, and the magneto-optical head may include a polarization altering element. In the present invention the polarization altering element may be a quarter-wave plate. The magneto-optical head may further include a reflective substrate and an optical element. See Column 2, line 43-62.

In addition, Wilde (375) discloses in Claim 6, that the optical system as recited in claim 5, further comprising an optical element that alters a polarization property of said impinging light and said reflected light, said optical element aligned in said optical path between said destination and said source.

Wilde (375) discloses in Claim 7, that the optical system as recited in claim 6, wherein said optical element comprises a quarter-wave plate.

It is implied herein that the use of quarter-wave plates in accordance with Wilde (372) above is equivalent to the use of first and second phase difference plates, as recited in Claims 4 and 10.

Conclusion

3. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (703) 305-7022. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (703) 308-4116. The fax phone numbers are (703) 872-9318 for regular response activity, and (703) 872-9319 for after-final responses. In addition the customer service fax number is (703) 872- 9317.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

PJ
November 13, 2003